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Ephemeris of the Satellites of Uranus, 1890. By A. Marth.

Greenwich Noon.	P	*Ariel.*			*Umbriel.*		
		a_1	b_1	u_1-U	a_2	b_2	u_2-U
1890.	°	″	″	°	″	″	°
Feb. 26	281·31	14·88	+9·52	101·55	20·74	+13·27	223·16
Mar. 8	·39	14·98	9·53	89·94	20·87	13·28	11·85
18	·49	15·06	9·52	78·29	20·99	13·26	160·51
28	·60	15·12	9·48	66·61	21·07	13·21	309·15
Apr. 7	·72	15·16	9·42	54·91	21·11	13·12	97·76
17	·84	15·16	9·33	43·19	21·12	13·00	246·37
27	281·95	15·15	9·23	31·44	21·10	12·86	34·96
May 7	282·06	15·10	+9·12	19·67	21·04	+12·71	183·54
17	·15	15·03	9·01	7·89	20·95	12·55	332·12
27	·23	14·95	8·89	356·10	20·82	12·39	120·70
June 6	·29	14·84	8·78	344·31	20·68	12·24	269·28
16	·33	14·73	8·68	332·52	20·52	12·09	57·87
26	·34	14·60	8·59	320·74	20·34	11·97	206·47
July 6	·33	14·47	8·52	308·97	20·16	11·86	355·09
16	282·31	14·34	+8·46	297·22	19·98	+11·78	143·72

	Titania.			*Oberon.*				
	a_3	b_3	u_3-U	a_4	b_4	u_4-U	U	B
	″	″	°	″	″	°	°	°
Feb. 26	34·01	+21·76	138·97	45·48	+29·10	2·62	359·72	+39·78
Mar. 8	34·24	21·78	192·45	45·79	29·14	269·97	359·78	39·51
18	34·42	21·75	245·91	46·03	29·09	177·30	359·86	39·19
28	34·56	21·66	299·35	46·21	28·96	84·62	359·94	38·82
Apr. 7	34·63	21·51	352·78	46·32	28·77	351·93	0·03	38·41
17	34·65	21·32	46·21	46·34	28·52	259·24	0·12	37·99
27	34·61	21·10	99·63	46·28	28·22	166·54	0·21	37·57
May 7	34·51	+20·85	153·05	46·15	+27·88	73·85	0·29	+37·17
17	34·36	20·59	206·47	45·94	27·53	341·16	0·36	36·82
27	34·16	20·32	259·90	45·68	27·18	248·48	0·42	36·52
June 6	33·92	20·06	313·34	45·37	26·84	155·81	0·46	36·28
16	33·65	19·83	6·79	45·00	26·53	63·16	0·48	36·12
26	33·36	19·63	60·26	44·62	26·25	330·52	0·49	36·04
July 6	33·07	19·46	113·75	44·22	26·02	237·90	0·48	36·04
16	32·77	+19·32	167·25	43·82	+25·84	145·30	0·45	+36·13

The values of P, *a*, *b*, *u*—U are to be interpolated for the times for which the apparent positions of the satellites are

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required (the degrees of the differences of successive values of $u-U$ being in the case of *Ar.* 1428°, *Um.* 868°, *Tit.* 413°, *Ob.* 267°), and the position-angles p and distances s are then found by means of the formulæ—

$$s \sin (p-P) = a \sin (u-U)$$
$$s \cos (p-P) = b \cos (u-U).$$

The satellites will be at their greatest elongations (N in position-angle P + 90°, S in position P − 90°) and at their conjunctions with the planet's centre (superior conjunction in position-angle P, inferior conjunction in position P − 180°) at the following hours, Greenwich mean time:—

Ariel.

	N. Elong.		S. Elong.			N. Elong.		S. Elong.			N. Elong.		S. Elong.	
1890.		h	d	h			h	d	h			h	d	h
Mar.	2	23·0	4	5·3	Apr.	9	18·4	11	0·6	May	17	13·8	18	20·0
	5	11·5	6	17·8		12	6·9	13	13·1		20	2·3	21	8·5
	8	0·0	9	6·3		14	19·4	16	1·6		22	14·8	23	21·0
	10	12·5	11	18·7		17	7·9	18	14·1		25	3·3	26	9·5
	13	1·0	14	7·2		19	20·4	21	2·6		27	15·8	28	22·0
	15	13·5	16	19·7		22	8·9	23	15·1		30	4·3	31	10·5
	18	2·0	19	8·2		24	21·3	26	3·6	June	1	16·8	2	23·0
	20	14·5	21	20·7		27	9·8	28	16·1		4	5·3	5	11·5
	23	2·9	24	9·2		29	22·3	M. 1	4·6		6	17·8	8	0·0
	25	15·4	26	21·7	May	2	10·8	3	17·1		9	6·3	10	12·5
	28	3·9	29	10·2		4	23·3	6	5·6		11	18·7	13	1·0
	30	16·4	31	22·7		7	11·8	8	18·1		14	7·2	15	13·5
Apr.	2	4·9	3	11·2		10	0·3	11	6·6		16	19·7	18	2·0
	4	17·4	5	23·6		12	12·8	13	19·1		19	8·2	20	14·5
	7	5·9	8	12·1		15	1·3	16	7·6		21	20·7	23	3·0

Umbriel.

		h	d	h			h	d	h			h	d	h
Mar.	4	18·1	6	19·9	Apr.	11	1·3	13	3·1	May	18	8·6	20	10·3
	8	21·6	10	23·3		15	4·8	17	6·5		22	12·0	24	13·8
	13	1·1	15	2·8		19	8·3	21	10·0		26	15·5	28	17·3
	17	4·5	19	6·3		23	11·7	25	13·5		30	19·0	J. 1	20·7
	21	8·0	23	9·7		27	15·2	29	16·9	June	3	22·5	6	0·2
	25	11·5	27	13·2	May	1	18·7	3	20·4		8	1·9	10	3·7
	29	14·9	31	16·7		5	22·2	7	23·9		12	5·4	14	7·1
Apr.	2	18·4	4	20·1		10	1·6	12	3·4		16	8·9	18	10·6
	6	21·9	8	23·6		14	5·1	16	6·8		20	12·3	22	14·1

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Titania.

	h			h		h			h
Mar. 1	4·1	S.	Apr. 4	23·9	May 9	19·9	S.	June 13	15·8
3	8·3	sup.	7	4·2	12	0·1	sup.	15	20·1
5	12·5	N.	9	8·4	14	4·4	N.	18	0·3
7	16·8	inf.	11	12·7	16	8·6	inf.	20	4·5
9	21·0	S.	13	16·9	18	12·9	S.	22	8·8
12	1·3	sup.	15	21·2	20	17·1	sup.	24	13·0
14	5·5	N.	18	1·4	22	21·4	N.	26	17·3
16	9·7	inf.	20	5·7	25	1·6	inf.	28	21·5
18	14·0	S.	22	9·9	27	5·9	S.	July 1	1·7
20	18·2	sup.	24	14·2	29	10·1	sup.	3	6·0
22	22·5	N.	26	18·4	31	14·4	N.	5	10·2
25	2·7	inf.	28	22·7	June 2	18·6	inf.	7	14·5
27	7·0	S.	May 1	2·9	4	22·8	S.	9	18·7
29	11·2	sup.	3	7·2	7	3·1	sup.	11	22·9
31	15·5	N.	5	11·4	9	7·3	N.	14	3·2
Apr. 2	19·7	inf.	7	15·6	11	11·6	inf.	16	7·4

Oberon.

	h			h		h			h
Mar. 1	6·4	N.	Apr. 10	16·0	May 21	1·7	N.	June 30	11·2
4	15·2	inf.	14	0·9	24	10·5	inf.	July 3	20·0
8	0·0	S.	17	9·7	27	19·3	S.	7	4·8
11	8·8	sup.	20	18·5	31	4·1	sup.	10	13·6
14	17·6	N.	24	3·3	June 3	12·9	N.	13	22·4
18	2·4	inf.	27	12·1	6	21·7	inf.	17	7·1
21	11·2	S.	30	20·9	10	6·5	S.		
24	20·0	sup.	May 4	5·9	13	15·3	sup.		
28	4·8	N.	7	14·5	17	0·9	N.		
31	13·6	inf.	10	23·3	20	8·9	inf.		
Apr. 3	22·4	S.	14	8·1	23	17·7	S.		
7	7·2	sup.	17	16·9	27	2·5	sup.		

Titania and *Oberon* will appear in opposite directions from the centre of the planet:—

	h		h		h
Feb. 28	23·7	Apr. 19	6·3	June 7	12·9
Mar. 25	15·0	May 13	21·6	July 2	4·3

and in the same direction:—

	h		h		h
Mar. 13	7·3	May 1	13·9	June 19	20·6
Apr. 6	22·6	26	5·2	July 14	11·9

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Ephemeris for Physical Observations of Mars, 1890. By A. Marth.

Greenwich Noon.	Angle of Position of ♂'s Axis.	Areographical Longit. of Centre of Disc.	Areographical Latit. of Centre of Disc.	Apparent Diameter.	q	Q	E	Light-ratio.
1890.	°	°	°	″	″	°	°	
Feb. 25	36·58	183·03	+10·19	8·24	0·85	282·53	37·39	0·170
27	36·43	164·04	9·85	8·38	·86	282·20	37·32	·177
Mar. 1	36·28	145·07	+9·52	8·53	·87	281·88	37·24	0·184
3	36·13	126·12	9·20	8·69	·88	281·56	37·14	·191
5	35·97	107·18	8·88	8·85	·89	281·25	37·02	·199
7	35·81	88·26	8·57	9·02	·90	280·94	36·87	·207
9	35·64	69·36	8·27	9·19	·91	280·63	36·71	·216
11	35·48	50·48	7·98	9·37	·92	280·33	36·52	·225
13	35·31	31·62	7·69	9·56	·93	280·04	36·31	·235
15	35·14	12·77	7·41	9·75	·93	279·76	36·07	·246
17	34·97	353·95	7·15	9·94	·94	279·48	35·81	·257
19	34·80	335·15	6·90	10·14	·94	279·21	35·52	·269
21	34·64	316·38	6·65	10·35	·95	278·96	35·20	·281
23	34·48	297·63	6·42	10·56	·95	278·71	34·85	·294
25	34·32	278·90	6·21	10·78	·95	278·48	34·47	·308
27	34·17	260·20	6·01	11·01	·94	278·26	34·06	·323
29	34·02	241·52	5·82	11·24	·94	278·05	33·62	·338
31	33·88	222·88	5·65	11·48	·93	277·85	33·14	·355
Apr. 2	33·74	204·26	+5·49	11·73	·92	277·67	32·62	0·372
4	33·62	185·67	5·35	11·98	·91	277·51	32·07	·391
6	33·50	167·11	5·22	12·24	·90	277·37	31·48	·410
8	33·40	148·58	5·12	12·51	·89	277·25	30·85	·431
10	33·30	130·09	5·04	12·78	·87	277·15	30·18	·453
12	33·22	111·63	4·97	13·06	·85	277·07	29·46	·476
14	33·15	93·21	4·93	13·35	·82	277·01	28·70	·500
16	33·10	74·83	4·91	13·64	·79	276·98	27·89	·526
18	33·06	56·49	4·91	13·94	·76	276·98	27·03	·553
20	33·04	38·19	4·93	14·24	·73	277·01	26·12	·581
22	33·03	19·92	4·98	14·54	·69	277·08	25·16	·610
24	33·04	1·70	5·05	14·85	·65	277·18	24·15	·641
26	33·06	343·52	5·15	15·15	·61	277·31	23·09	·672
28	33·10	325·38	5·27	15·46	·56	277·49	21·97	·705
30	33·16	307·29	5·42	15·77	·51	277·72	20·80	·739
May 2	33·24	289·24	+5·59	16·08	·46	278·00	19·57	0·773
4	33·33	271·23	5·78	16·38	·41	278·34	18·29	·808